

TITLE OF THE INVENTION

VIDEO-IMAGE CONTROL APPARATUS AND METHOD AND  
STORAGE MEDIUM

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BACKGROUND OF THE INVENTION

This invention relates to video control apparatus and method and a storage medium, and more particularly, to video control apparatus and method and a storage  
10 medium for transferring an input video image, obtained in accordance with a request from a remote client, to the client .

The assignee of the present invention has already filed several systems where a client can obtain a video  
15 image by connecting with a remote camera server (device which controls a camera and transfers an obtained video image to a client) via an existing network.

The camera server uses a general-purpose device such as a personal computer and a work station. A card  
20 (or board) having a video capture function is attached to the device, and a video camera is connected to the card. Further, to control the camera angle (e.g., panning, tilting and zooming) of the video camera at the camera server by the client, the assignee of the present  
25 invention has proposed a system where a camera device, placed on a predetermined panhead, has a variable zoom

value, and a signal to control the camera angle is outputted from the camera server main body to the camera device via a predetermined interface (e.g., a serial interface generally included by a personal computer).

5           On the other hand, the client also comprises a general device such as a personal computer and a work station.

          In the above systems, it is possible to confirm a video image obtained by a remote camera, however,  
10   regarding respective displayed objects in the video image, information other than the video image of the objects cannot be obtained.

#### SUMMARY OF THE INVENTION

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          To solve the above problem, the present invention provides a video-image control apparatus having video-image input means, which transfers a video image, inputted in accordance with a request from a remote  
20   client, to the client, comprising: generating means for generating an additional image based on pre-stored information corresponding to an object in the video image inputted by the video-image input means; combining means for combining the additional image generated by  
25   the generating means, with the video image inputted by the video-image input means; and transfer means for

transferring an image obtained from combining by the combining means, to the client.

Other features and advantages of the present invention will be apparent from the following  
5 description taken in conjunction with the accompanying drawings, in which like reference characters designate the same name or similar parts throughout the figures thereof.

#### 10 BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate embodiments of the invention and, together  
15 with the description, serve to explain the principles of the invention.

Fig. 1 is a block diagram showing a system as a presuppositional part of the embodiments;

Fig. 2 is a flowchart showing a process procedure  
20 of a command interpreter in Fig. 1;

Fig. 3 is a table showing an example of a data format of information generated by a reservation register in Fig. 4;

Fig. 4 is a table showing an example of a  
25 management format of data stored in an image memory in Fig. 1;

Fig. 5 is a flowchart showing a process procedure of a timer in Fig. 1;

Fig. 6 is a table showing an example of a data format of information generated by the reservation  
5 register according to a third example of the presuppositional part of the embodiments;

Fig. 7 is a block diagram showing the system according to a fourth example of the presuppositional part of the embodiments;

10 Fig. 8 is a flowchart showing a reservation registration process procedure according to a fifth example of the presuppositional part of the embodiments;

Fig. 9 is a block diagram showing the system according to a sixth example of the presuppositional  
15 part of the embodiments;

Fig. 10 is a flowchart showing the operation of a command interpreter 6012 according to a sixth example of the presuppositional part of the embodiments;

Fig. 11 is a block diagram showing the system  
20 according to a first embodiment;

Fig. 12 is a flowchart showing process procedure of the command interpreter in Fig. 11;

Fig. 13 is a flowchart showing a process procedure of the timer in Fig. 11;

25 Figs. 14A to 14D are views respectively showing time transition of video image transfer from the server

of the first embodiment;

Fig. 15 is an example of a management table according to the first embodiment;

Fig. 16 is a modified example of the management  
5 table according to the first embodiment;

Fig. 17 is an example of the management table according to a second embodiment;

Fig. 18 is a block diagram showing the system according to a third embodiment;

10 Fig. 19 is a flowchart showing a process procedure of the command interpreter in Fig. 18;

Fig. 20 is a flowchart showing a process procedure of the timer in Fig. 18;

Fig. 21 is a block diagram showing the system  
15 according to a fourth embodiment;

Figs. 22A and 22B are explanatory views showing area designation according to the fourth embodiment;

Fig. 23 is a modified example of the management table of the embodiments;

20 Fig. 24 is an example of information displayed when an anchor of the embodiments is clicked;

Fig. 25 is a block diagram showing the system according to a fifth embodiment;

Fig. 26 is a block diagram for explaining the  
25 outline of the operation of the fifth embodiment;

Fig. 27 is a flowchart showing a process procedure

according to the fifth embodiment;

Fig. 28 is an example of user interface of an applet of the fifth embodiment;

Fig. 29 is an explanatory view showing combination  
5 of a video image and a message according to the fifth embodiment;

Fig. 30 is a display example upon operation of a sixth embodiment; and

Fig. 31 is a flowchart showing a process procedure  
10 according to a seventh embodiment.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Prior to description of preferred embodiments of  
15 the present invention, a presuppositional part of the embodiments will now be described.

##### <Outline>

As described above, the present applicant has proposed systems where a video image obtained by a  
20 camera connected to a remote camera server is obtained from a client side via an existing network, and further, the camera angle (pan, tilt, zoom values) of the camera can be controlled from the client side.

One of characteristic features of the systems is  
25 that the camera can be controlled by using, not well-known monitor camera or the like, but a general network

(the Internet) protocol, and the control is made within the range of the protocol.

Fig. 1 is a block diagram showing a camera server apparatus. In Fig. 1, reference numeral 1003 denotes a camera in which its camera angle, image sensing condition and the like are controllable; 1001, a controller which controls the camera 1003 in accordance with an instruction from an external device 1002, and sends an obtained video image to the external device 1002. The controller 1001 is realized by comprising a personal computer, for example. The controller 1001 outputs a control signal via RS-232C interface or the like to the camera 1003. The controller 1001 has a camera controller 1017 which controls the camera angle, a video-image input unit 1018 which inputs a video image obtained by the camera 1003 by an image capture device or the like, and a communication interface unit 1011 for information exchange between the apparatus and another apparatus via a network adapter or the like. In addition to these resources, the controller 1001 has the following elements, by realizing them as programs and memory data utilizing respective resources such as a CPU, a memory and an auxiliary storage device of a computer.

That is, the controller 1001 has a command interpreter 1012, an acceptance code generator 1013, a timer 1015, an image memory 1019, and a reservation

register 1014 (these elements will be described in detail below).

The external device 1002 is a WWW server or a WWW browser, for example. If the external device 1002 is a  
5 WWW server, the present apparatus is managed by the WWW server, and the WWW browser sends a request, in accordance with a URL (Uniform Resource Locator) indicating the storage destination of desired data, to a WWW server which is a storage of document data and image  
10 data. In response to the request, the WWW server returns corresponding document data or image data to the WWW browser.

If the external device 1002 is a WWW browser, the function of the above WWW server is included in the  
15 present apparatus.

For the sake of simplicity of explanation, the external device 1002 is a WWW client here. Communication is performed among the devices by the HTTP protocol, and the camera control apparatus 1001 behaves as if it is a  
20 WWW server in video data application. This is possible by applying the WWW server's communication method to the present control apparatus.

Generally, when image data is pasted in a WWW document, the request command is described as follows:

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(A character string in quotation marks "" is described as a single string without any line-feed/new paragraph mark.)

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This means that it is requested to transfer image data stored in a file "image001.gif" in a WWW server "www.foo.co.jp". In this example, the file name part is interpreted as a command.

10

As an example, camera-angle destination such as panning, tilting and zooming are represented by alphabets "P", "T" and "Z" respectively, then, respective control amounts are represented by numerical values. For example, assuming that the server has a camera having a pan angle from -50° to 50°, a tilt angle from -20° to 20° and 1 to 8 times zooming, when image sensing is performed with a pan angle of 20°, a tilt angle of 5° and twice zooming, and the obtained image is pasted (transferred) as "gif" format image data, the description is as follows. Note that the network address of the present camera control apparatus is "www.foo.co.jp".

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In this case, the WWW browser, external device

1002, outputs the above character string in HTML (Hyper-  
Text Markup Language) requires the camera control  
apparatus 1001 to provide the image data. More  
specifically, when this request enters the camera  
5 control apparatus 1001 via the communication interface  
unit 1011, the command interpreter 1012 is activated to  
start interpretation of the request and processing for a  
response to the request.

Fig. 2 is a flowchart showing an example of the  
10 processing.

First, at step S101, the command described as a  
file name is interpreted. That is, if the head of the  
request is "P", the command is recognized as an image-  
sensing command, then process proceeds to step S102. At  
15 this step, the camera 1003 is controlled via the camera  
controller 1017 based on the designated pan, tilt and  
zoom values (step S102). The obtained image is converted  
into data of the designated image format, then sent to  
the external device 1002 requiring the image data, via  
20 the communication interface unit 1011.

At this time, as the communication interface unit  
1011 uses the HTTP protocol, content-type information  
and status information corresponding to the image format  
are added to the head of the image data. Then, the  
25 process ends.

Thus, the obtained video image is pasted in the

HTML document as if it is image data stored in a file in the WWW server.

In the command interpretation at step S101, if the head of the request is "R", the command is recognized as  
5 a reservation command. Then, the process proceeds to step S105 via the determination of image-sensing condition at step S104.

The reservation command is used for a service to make reservation of image sensing, and later transfer an  
10 obtained video image to a client. The reservation command starts with "R"; then it continues with integers indicating year, month, day, hour, and minute, each terminated with a period, and with designation of panning, tilting and zooming as image-sensing condition;  
15 finally it ends with a name indicating the image format.

For example, if video-image sensing is programmed with image-sensing time of 13:15 on July 6, 1996, a pan angle of 25°, a tilt angle of 0° and a 3 times zooming, in gif format, the reservation is described as follows:

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When the above reservation command is designated, the camera server transfers a unique identification  
25 number as an acceptance code from the acceptance code generator 1013 to the external device 1002, at step S105.

The external device 1002 that has received the acceptance code can obtain a video image obtained by image sensing based on the above reservation later. The acceptance code may be a count value which is  
5 incremented by one (+ 1) at each request generated, or may be a numerical value indicating the designated time (year, month, date and time).

Then, the acceptance code, the image-sensing time, the image-sensing condition and the image format are  
10 registered into the reservation register 1014 (step S106). The acceptance code is returned via the communication interface unit 1011 to the external device 1002 which issued the reservation command (step S107).

Note that at this time, content-type information  
15 and status information, indicating that the response is an acceptance code, are added to the head of the code. Then the process ends.

However, if an HTML document including such image-sensing reservation is simply generated but a general  
20 WWW browser is used to display the obtained image, the acceptance code instead of image data is returned and an image is not displayed. However, if image-sensing is reserved with respect to the camera control apparatus 1001 by using a CGI program or the like of the WWW  
25 server, in the same manner as that in the WWW browser, and after an acceptance code has been obtained, an HTML

document is generated with image-data description designating the acceptance code by an image read command to be described later, image sensing can be performed as programmed when the document is displayed by the WWW  
5 browser, and the image data can be displayed.

Note that the image read command starts with alphabet "G", then continues with the acceptance code, and ends with the extension indicating the image format. The acceptance code is returned to the external device  
10 1002 upon reservation.

For example, if "12543" is returned as an acceptance code, to read the image obtained by programmed image sensing, the following description is used:

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The reservation register 1014 is stored in the format of a table, for example, as shown in Fig. 3, into  
20 a memory device of the controller 1001 or the auxiliary storage device. For example, in the above reservation, when the acceptance code is "12543", the contents of the reservation is described as the first row of the table in Fig. 3.

25 When the reservation has been registered, image sensing as programmed is performed at the image sensing

time, based on the timer to be described later. The image data is stored in the image memory 1019.

The image memory 1019 is realized in the format as shown in Fig. 4, for example, in the memory device of the controller 1001 or the auxiliary storage device (e.g., a hard disk). For example, the result of image sensing by the above reservation is recorded, as image data of the designated format, with the acceptance code and image format information, in the first row of the table in Fig. 4.

In the command interpretation at step S101, if the head of the command is "G", it is determined that the command is an image read command. The process proceeds via determination at steps S104 to S108 to step S109, at which data stored in the image memory 1019 is searched.

Then, it is determined whether or not the data obtained by the above search has the same value of the acceptance code described as the image read command (step S110). If YES, the image data is read, and transferred via the communication interface unit 1011 to the external 1002 requesting the image data.

Also at this time, as the communication interface unit 1011 uses the HTTP protocol, content-type information and status information corresponding to the image format are added to the head of the image data (step S111). At step S112, the image data in the storage

area of the image memory 1019, from which the image data has been read out, is deleted. Then the process ends.

If it is determined at step S110 that image data corresponding to the designated acceptance code is not  
5 stored, error information indicating that the programmed image sensing has not been performed is returned via the communication interface unit 1011 to the external device 1002 requesting the image data. Then the process ends.

Further, if it determined at step S108 that the  
10 head of the command from the external device 1002 is not "G", error information indicating that the command is an undefined command is returned via the communication interface unit 1011 to the external device 1002 requesting the image. Then the process ends.

15 As described above, information exchange is performed between the external device 1002 and the camera control apparatus 1001 of the present embodiment.

Next, the timer 1015, used for performing camera control and storing the result of image-sensing, based  
20 on reservation data registered in the reservation register 1014, will be described.

In the timer 1015, at intervals of a predetermined period, e.g., one minute, a timer program is activated. This program is realized by utilizing a timer of a  
25 computer or the like. The operation of the timer program will be described with reference to the flowchart of Fig.

5.

First, the current time is read from a timer of the camera control apparatus 1001 (step S201), and the process proceeds to step S202. At step S202, reserved  
5 contents, i.e., items of programmed image sensing sequentially registered in a respective columns of the table of the storage device are read from the reservation register 1014. When it is determined at step S203 that all the items of programmed image sensing have  
10 been read out, the process ends, otherwise, the process proceeds to step S204. At step S204, if it is determined that the designated time in the reserved data is in the future, the process returns to step S202 to repeat the processing. On the other hand, if it is determined at  
15 step S204 that the designated time has come, the process proceeds to step S205, at which the camera 1003 is controlled to perform image sensing, by the camera controller 1017, in accordance with the image-sensing condition of the items of the programmed image sensing  
20 read from the reservation register 1014. Then, the obtained image is converted into image data of the image format designated by a corresponding item of the programmed image sensing. The image data is stored, with an acceptance code and image format information, into  
25 the image memory 1019 (step S206). Next, the read items of programmed image sensing are deleted from the



reservation register 1014 (step S207), and the process returns to step S202 to repeat the processing.

In this manner, image sensing is performed as programmed, and the result of the image sensing is  
5 stored. Thereafter, when an image read command is sent from the external device 1002, the image data is returned in response to the command.

As described above, a live image (i.e., current video image) obtained by controlling a remote camera can  
10 be easily pasted in a WWW document by connecting the camera control apparatus to a network of the WWW system, and describing a URL where description of image-sensing condition is added to the address of the camera control apparatus, as the source of the image data. Note that if  
15 only pasting the image data in a WWW document is performed, the acceptance code generator 1013, the timer 1015, the image memory 1019 and the reservation register 1014 are unnecessary, and step S104 and the subsequent steps of the processing by the command interpreter 1012  
20 are unnecessary.

Further, by providing the timer 1015, the image memory 1019 and the reservation register 1014, programmed image sensing can be reserved, and later the result of image sensing can be taken into a WWW page and  
25 the image can be displayed in the WWW page, by utilizing a CGI program of a WWW server or the like. Especially,

if image sensing is tried by controlling a remote camera when the network is overcrowded, image transfer takes much time and cannot smoothly provide image data.

However, according to this construction, image sensing  
5 in such time is programmed with specific camera angle for a necessary period, and the programmed image sensing is reserved, thereafter, stored image data can be read when the network becomes less crowded, e.g., at midnight.

Especially, image sensing can be performed plural  
10 times with the same camera angle at short intervals regardless of the transmission capacity of the network.

Note that the HTTP protocol is used as the interface between the camera control apparatus 1001 and the external device 1002, however, any other  
15 communication interface can be used.

Note that the acceptance code is used to identify sensed image data corresponding to the reservation of programmed image sensing, however, it may be arranged such that, instead of using the acceptance code  
20 generator, a unique request code is generated on the external device 1002 side as a part of a reservation command, then the camera control apparatus 1001 identifies the image data by the correspondence between the request code and the external device 1002.

25 Further, image-sensing time is designated in minute unit, however, it may be designated second or

millisecond unit.

In the present embodiment, to indicate the image format, the extension "gif" is employed. It may be arranged such that the image format indicated by the  
5 extension "gif" is arbitrarily changed for a JPEG format indicated by an extension "jpg".

Further, the file name is regarded as a command, however, a parameter description of a URL can be utilized. For example, panning, tilting, zooming and  
10 image format are respectively set to "25°", "5°", "twice" and "gif", image sensing can be programmed by the following description:

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Further, a WWW server may be installed into the camera control apparatus of the present embodiment. In  
20 this case, for example, a name "camctl.exe" is given to the program of the command interpreter 1012 as a CGI program for the WWW server, and the image sensing can be programmed by the following description:

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<Second Example>

In the above first example, programmed image sensing can be reserved for only one image. Next,  
5 another example will be described as a construction where a plurality of reservation commands are combined by "+" into a single file name, and a file extension indicating the image format is added to the file name, so as to reserve programmed image sensing with a  
10 plurality of image-sensing times and/or a plurality of camera angles.

For example, if image sensing is programmed with image-sensing times of 13:15, 13:30 and 13:45 on July 6, 1996, a pan angle of 25°, a tilt angle of 0°, 3 times  
15 zoom ratio, with intention to read three images in "gif" format later, the reservation is described as follows:

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Note that if the image sensing is performed plural times at the same time or on the same date or at the same camera angle, the corresponding information in the  
25 character string may be omitted. For example, the above reservation command may be described as follows:

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The basic construction of the second embodiment is substantially the same as that of the first embodiment except the following changes.

That is, in the process procedure of the command  
10 interpreter 1012, steps S106, S111 and S112 are executed to interpret the command including the above description.

That is, at step S106, the command is not interpreted as one, but as a plurality of reservation  
15 codes combined by "+". At step S105, the image-sensing times and image-sensing conditions designated by the respective reservation commands are registered, with the same reservation command and image format information, into the reservation register 1014.

20 On the other hand, at step S111, a plurality of image data registered with the same reservation code are read out, and the image data are re-formatted into a single image data including a plurality of images, and the image data is returned via the communication  
25 interface unit 1011 to the external device 1002 requesting the image data. At this time, as the

communication interface unit 1011 uses the HTTP protocol, content-type information and status information corresponding to the image format are added to the head of the image data.

5           At step S112, the data in the storage areas in the image memory 1019, corresponding to the plurality of read image data, are deleted.

          The above construction enables a number of reservations and handles a plurality of image data  
10   obtained by the plurality of programmed image sensing as a single image data file comprising a plurality of images, thus unnecessitates management of a plurality of acceptance codes corresponding to the respective images.

          Further, if this technique is applied to interval  
15   image sensing such as a record of a plant's growth, an image file containing a series of images can be handled as a pseudo moving image.

#### <Third Example>

20           In the above second example, in case of image sensing at the same camera angle and at fixed intervals, reservation commands must be combined corresponding to the number of image sensings. In the third example, immediately after the designated time, end time and  
25   interval time are added, and then image-sensing condition such as a camera angle and the image format

are designated. The end time is designated by numerical values following alphabet "t", and the interval time is designated by numerical values following alphabet "e" in minute unit.

5           For example, in a case where image sensing is programmed with image-sensing time of 13:15, 13:30 and 13:45 (i.e., at 15-minutes intervals) on July 6, 1996, a pan angle of 25°, a tilt angle of 0° and 3 times zooming, with intention to read three images later, the  
10 reservation command is described as follows:

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As described above, if the image-sensing date or time are the same, the description of these image-sensing date or time can be omitted. In such case, the reservation command is described as follows:

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The basic construction of the third example is substantially the same as that of the first example

except the following changes.

That is, in the process procedure by the command interpreter 1012, steps S106, S111 and S112 are changed to interpret the above reservation command.

5           In this case, it is necessary to arrange the table format registered in the reservation register 1014 as shown in Fig. 6. That is, the item of the end time is added to the table as shown in Fig. 6.

          At step S106, if the reservation command has end  
10   time and interval time, the reservation is registered with the time of reservation as image-sensing time, and with the acceptance code, the image-sensing condition, and the image format, into the reservation register 1014. If the requested reservation command indicates simple  
15   reservation without end time and interval time, the image-sensing time is set as the end time, and the interval time is set to "1".

          At step S111, a plurality of image data registered having the same acceptance code are read, then re-  
20   formatted as a single image data including a plurality of image data, and returned via the communication interface unit 1011 to the external device 1002 requesting the image data. At this time, as the communication interface unit 1011 uses the HTTP protocol,  
25   content-type information and status information corresponding to the image format is added to the head



of the image data. At step S112, data in the storage areas in the image memory 1019, corresponding to the plurality of read image data, are deleted.

On the other hand, at step S207, the registered  
5 reservation information is updated with information obtained by adding the interval time in the read items of the programmed image sensing, and if the updated image-sensing time is behind the end time, the item of the image-sensing time is deleted from the reservation  
10 register 2014.

The above construction enables to easily perform interval image sensing by a short reservation command.

Especially, when interval image sensing is performed for a long period, the second example cannot  
15 substantially perform the image sensing due to the lengthiness of the reservation command. However, the third example easily performs such image sensing if the memory capacity for storing image data is sufficient.

#### 20 <Fourth Example>

The third example reads the result of interval image sensing as a plurality of still image data. Next, a fourth example where the result of interval image sensing is read as moving image data will be described.

25 Upon reading the result of interval image sensing as moving image data, the file extension is set to "mpg".

For example, the reservation command is as follows:

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Fig. 7 shows the basic construction of the camera control apparatus according to the fourth example. The fourth example has substantially the same construction as that of the first example except the following  
10 changes. That is, a video-image compressor 2021 such as an MPEG1 compressing unit is added, and the command interpreter 4012 which interprets the above command is provided.

15 For example, at step S111, if the designated image format is a still image format such as "jpg" or "gif", a plurality of image data registered with the same reservation code are read, then, they are re-formatted into a single image data including a plurality of image  
20 data, and the image data is returned via the communication interface unit 1011 to the external device 1002 requesting the image data. If the designated image format is "mpg", a plurality of image data registered with the same reservation code are read and decoded,  
25 then the images are compressed by the video-image compressor 2021, and the compressed moving image data

are returned via the communication interface unit 1011 to the external device 1002 requesting the image data.

At this time, as the communication interface unit 1011 uses the HTTP protocol, content-type information and status information corresponding to the image format  
5 are added to the head of the image data.

The above construction compresses image data by using the relation between image frames, and especially in interval image sensing with slight change, compresses  
10 image data by a large data amount. This reduces the amount of communication when the image data are read, thus greatly shortens communication time.

#### <Fifth Example>

15 In the third example, the same camera angle is designated for interval image sensing. Next, a fifth example will be described as a construction where a definition of a control variable is added immediately before the designation of image-sensing time in a  
20 reservation command, and then, the image-sensing time, the image-sensing condition such as a camera angle and the image format are designated after the image-sensing time, so as to reserve repetitive image sensing. That is, the reference to the control variable is designated in  
25 designation of image-sensing time and image-sensing condition.

The definition of the control variable starts with "\$(", and through a definition main body, and ends with ")".

The definition main body is described by two ways  
5 of representation. One description is designating an initial value, an end value, and an increment. It is further divided into two descriptions depending on whether the increment is positive or negative. Further, there is another description designating all the values  
10 of the control variable:

`$(<control variable>=<initial value>,upto<end value>,up<increment>)`

`$(<control variable>=<initial value>,downto<end value>,down<increment>)`  
15

or

`$(<control variable>=<value 1>,<value 2>,<value 3>,<value4>,...<value n>)`

20 Note that <control variable> is a character string, comprising at least one alphabet letter, as an identifier of the control variable.

The reference of the control variable starts with "\$(", and through a reference main body, ends with ")".  
25 The reference main body is operation using the four arithmetic rules (addition, subtraction, multiplication

and division) including the control variable.

For example, if image sensing is programmed with  
image-sensing time of 13:15 on July 6, 1996, and with  
pan angle of 25°, tilt angle of 0°, and 3 times  
5 zooming,

pan angle of 30°, tilt angle of 0°, and 3 times  
zooming,

pan angle of 35°, tilt angle of 0°, and 3 times  
zooming,

10

(In practice, as the angle is changed, there are time-  
lags between these change of camera angle), and three  
images in "gif" format are read later, the reservation  
command is described as follows:

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"http://www.foo.co.jp/R\$(pan=25,upto35,up5)1996.7.6.13.1  
5P\$(pan)T0Z3.gif"

or

"http://www.foo.co.jp/R\$(pan=0,upto10,up5)1996.7.6.13.15  
20 P\$(pan+25)T0Z3.gif"

or

"http://www.foo.co.jp/R\$(pan=35,downto25,down5)1996.7.6.  
13.15P\$(pan)T0Z3.gif"

or

25 "http://www.foo.co.jp/R\$(pan=25,30,35)1996.7.6.13.15P\$(p  
an)T0Z3.gif"

The basic construction of the fifth example is the same as that of the second example, though it differs from the second example in that the command interpreter  
5 1012 interprets the above description.

For example, the processing at step S106 is changed as shown in Fig. 8.

Note that if the character subsequent to "R" is "\$", as the definition of a control variable is  
10 described, the reservation command is described in accordance the fifth example. At step S501, one control variable definition which starts with "\$(" and ends with ")" is obtained, and at step S502, it is determined whether or not all the definitions have been obtained.  
15 After all the definitions have been obtained, the control variable is initialized at step S503.

At step S504, the rest of the command is scanned to find a control variable reference which starts with "\$(" and ends with ")", and previously initialized  
20 corresponding variable is replaced with the obtained control variable reference. At step S506, the character string obtained by the above processing is interpreted as a reservation command for the above-described repetitive image sensing. Then the programmed image  
25 sensing is registered with the same reservation code generated at step S105 and image format, and with

designated image-sensing times and image-sensing  
conditions designated by the respective reservation  
commands, as a plurality of reservations, into the  
reservation register 1014. This processing is repeated  
5 until all the control variables have reached end values.

Thus, the above construction enables to easily  
perform interval image sensing while changing the camera  
angle by a short command.

Further, the present example uses only one  
10 definition of control variable, however, a plurality of  
definitions can be described as nested definition.

In the fifth example, repetitive construction is  
introduced; similarly, other constructions such  
condition-judgment, definition of variable, substitution  
15 of variable, operation using for arithmetic rules and  
the like, can be introduced.

That is, it may be arranged such that the command  
interpreter is realized as a program interpreter, to  
store the content of a URL as a program, and interpret  
20 and perform the program. This automatically performs  
even complicated camera control.

#### <Sixth Example>

In the fifth example, the camera angle of  
25 programmed image sensing must be described in the same  
URL. Then, in a sixth example, a part of a reservation

command is separately registered as a macro library. In this example, data describing image-sensing time and image-sensing condition is stored in an external device.

For the purpose of explanation, it is assumed that  
5 image sensing is programmed with image-sensing time of 13:00 on July 6, 1996, while changing the camera angle by every minute as follows:

pan angle of 25°, tilt angle of 0°, 3 times  
zooming

10 pan angle of 30°, tilt angle of 0°, 3 times  
zooming

pan angle of 35°, tilt angle of 0°, 3 times  
zooming

pan angle of 35°, tilt angle of 1°, 4 times  
15 zooming

pan angle of 35°, tilt angle of 2°, 4 times  
zooming

pan angle of 35°, tilt angle of 3°, 5 times  
zooming

20 pan angle of 35°, tilt angle of 4°, 5 times  
zooming

pan angle of 35°, tilt angle of 5°, 6 times  
zooming

pan angle of 35°, tilt angle of 5°, 7 times  
25 zooming

pan angle of 35°, tilt angle of 5°, 8 times



zooming

Commands designating the above image-sensing conditions and image-sensing times are stored into the  
5 secondary external device at:

`http://www.bar.co.jp/camcon-a.ctl`

In this case, the content of the file is, for  
10 example, as follows:

`R1996.7.6.13.0P25T0Z3+R1996.7.6.13.1P30T0Z3+R1996.  
7.6.13.2P35T0Z3+R1996.7.6.13.3P35T1Z4+R1996.7.6.13.4P35T  
2Z4+R1996.7.6.13.5P35T3Z5+R1996.7.6.13.6P35T4Z5+R1996.7.  
15 6.13.7P35T5Z6+R1996.7.6.13.8P35T5Z7+R1996.7.6.13.9P35T5Z  
8.gif`

The command to be provided to the camera control apparatus starts with "%23(", then has the URL, and ends  
20 with ")". The reservation command is described as follows:

`"http://www.foo.co.jp/%23(httpd%3e//www.bar.co.jp/camcon  
-a.ctl)"`

25

In this case, "www.bar.co.jp" corresponds to the

above secondary external device. That is, the camera server "www.foo.co.jp" is required to perform control in accordance with the content described at "www.bar.co.jp/camcon-a.ctl". The above description  
5 "R1996...." is stored in the "camcon-a.ctl".

Fig. 9 shows the sixth example. In comparison with the fifth example, the basic construction of the sixth example is substantially the same as that of the fifth example except that a command interpreter 6012  
10 interprets the above reservation command and a secondary external device 10024 is provided.

Next, the operation of the command interpreter 6012 will be described with reference to the flowchart of Fig. 10.

15 At step S621, a command described as a file name is interpreted. If the head of the command is "%23", it is recognized as an external reference command, then process proceeds to step S622. At step S622, a bracketed description "()" is regarded as a URL designating the  
20 stored file in which the command is described, and a file transfer request is issued in accordance with the URL. In the above case, the file transfer request is sent to the secondary external device 10024. Then at step S623, a response is awaited.

25 As a result, a long reservation command as above is returned. The returned reservation command is

developed by replacing it with the interpreted external reference command, for use in the subsequent command interpretation (step S624). Then the process proceeds to step S101.

5           Note that at step S621, if the command is not an external reference command, the process also proceeds to step S101.

          The processing at step S101 and the subsequent steps is identical to that described in the first  
10   embodiment, therefore, explanation of those steps will be omitted. Further, modification to the second to fifth examples can also be applied to this example.

          By the above construction, it is possible to easily perform interval image sensing programmed with  
15   complicated changes of time and camera angle by a short command.

          In this example, the camera control apparatus and the external apparatus are described as separate apparatus, however, they may be integrated as a single  
20   apparatus. In this case, the URL is described as follows:

"http://www.foo.co.jp/%23(http%3e//www.foo.co.jp/camcontrol.actl)"

25

or

"http://www.foo.co.jp/%23(camcon-a.ctl)"

If the command is stored in the external device to  
5 which an image transfer request is first issued, the  
address of the device can be used. In such case, the  
secondary external device is unnecessary.

<First Embodiment>

10 In the above first to sixth examples, various ways  
of descriptions can be used in a reservation command,  
and a live video image and an image-sensed video image  
is obtained by a WWW browser. However, it is impossible  
to obtain more detailed information on a desired object  
15 in the displayed video image. The present embodiment  
attains the information on a desired object in a  
displayed video image.

For the sake of simplification, it is assumed that  
an apparatus as the above-described camera server and a  
20 client are provided on a network in a company. Note that  
the number of the camera servers and that of the clients  
may be arbitrarily determined.

Generally, when a network is constructed, various  
servers may be provided on it. Especially, in recent  
25 years, an integrated system has been constructed by  
connecting devices which have been used as stand-alone

devices, such as a copier and a facsimile apparatus are connected on the network..

When a network is constructed and printing is attempted by using a remote print server, for example,  
5 print data output is completed in a very short period for a client, since the print server spools the print data. As the print server may also receive print data from a plurality of clients, the print data are outputted in accordance with the spooled order, to a  
10 printer.

The problem here is that the print server is not always near the client. When a plurality of clients perform print processing at the same time, the print data are queued, and when a user of one client goes to  
15 pick up a printout, the user often finds that printing based on another print data is still performed.

In the present embodiment, when a remote camera is controlled, if there is a printer as the object of printing desired by a client, within the view of the  
20 image, the status of the printer is added as additional information to the video image, and transferred to the client.

Fig. 11 is a block diagram showing a server according to the first embodiment, comprising the  
25 following constituents.

Numeral 1003 denotes a camera in which a camera

angle and image-sensing condition are controllable; and  
1001, a controller which controls the camera 1003 in  
accordance with an instruction from an external device  
1002, and returns an obtained video image. The  
5 controller 1001 is realized with e.g. a personal  
computer as a base. The controller 1001 further has a  
camera controller 1017 which controls the camera 1003 by  
RS-232C interface or the like, a video-image input unit  
1018 which inputs a video image obtained by the camera  
10 1003 by using an image capture device, and a  
communication interface unit 1011 for information  
exchanged between the present apparatus and another  
device. In addition to these resources, the controller  
1001 has the following elements realized as programs and  
15 memory data utilizing a CPU, a memory device of a  
computer, an auxiliary storage device and the like.

That is, the controller 1001 has a command  
interpreter 1012, an acceptance code generator 1013, a  
timer 1015, an image memory 1019, a reservation register  
20 1014, and a video-image process unit 7020 which  
processes a video image obtained from the video-image  
input unit 1018.

The external device 1002 is, for example, a WWW  
server or a WWW browser which performs communication by  
25 using the HTTP protocol. That is, a WWW browser issues a  
request in accordance with a URL indicating a storage

destination of a desired data, to a WWW server in which document data and image data are stored. In response to the request, the WWW server returns corresponding document data or image data to the WWW browser.

5           A copier system 1007 is a copier having a network interface. Upon reception of a status information request via communication, the copier system 1007 returns status information of the copier at that time. For example, assuming that the identifier (name) of the  
10 copier is "copier#445", if it is printing when it receives a status information request, it returns status information as follows, including printing-progress status and printing settings:

15 "copier#445" client:Kurosawa printing "80%" "1 copy, page 23, double-sided"

"client: Korosawa" indicates the name of the client (or ID) that issued the present print job on the  
20 network. Note that "Kurosawa" who ordered printing, "1 copy" and "double-sided" depend on the print job, but "80%" and "page 23" vary with time. Further, the items of the returned information are not limited to above items but may be any other information. For example, if  
25 there is no print sheet and printing cannot be performed, information indicating this status is included in the

information.

Note that the copier system 1007 also functions as an ordinary printer and an image scanner. Further, as it is impossible to return the above status information if  
5 the total number of pages in one print job is unknown, the copier system 1007 has an external storage device with a capacity large enough to store a queue of print jobs, such as a hard disk or the like. Further, when the copier system 1007 comprises a single copier, the above  
10 external storage device is necessary, however, if the copier system 1007 comprises a general-purpose device such as a personal computer and a device having only printing, copying and image reading functions, the general-purpose device manages the respective jobs.  
15 Accordingly, as the function to manage the jobs is realized by an external device and a program for performing the processings of the external device, the function may be provided in the controller 1001.

In the present embodiment, the communication  
20 interface unit 1011 is realized by a WWW server. That is, communication is performed by using the HTTP protocol, and the controller 1001 behaves as if it is a WWW server in application of video data. This can be realized if the controller 1001 also uses the communication method  
25 for the WWW server.



<Procedure>

The external device 1002 requires video image information by issuing a description as follows in accordance with the above-described first to sixth  
5 examples:

\$ (pan=0, upto180, up10) P\$ (pan) T0Z2

Assuming that the address of the controller 1001  
10 in communication with the camera 1003 (temporarily "camera#122") is "www.camera122.foo.co.jp", and time to require a video image is "from 13:00 to 13:18, at 1-minute intervals, on November 11, 1996", the above request is described as follows in one line.

15

http://www.camera122.foo.co.jp/R\$ (pan=0, upto180, up10) 199  
6.11.11.13.0t1996.11.11.13.18e1\$ (pan) T0Z2.mpg

On the other hand, the camera controller 1001  
20 operates as follows.

Similar to the above-described first to sixth examples, regarding given control information, the controller 1001 controls the camera 1003 to operate in accordance with the control information and perform  
25 image sensing. Note that if it is determined that a device such as a copier is included in the view (a

management table, containing angle information on an angle including the copier, is stored into a predetermined storage device in advance), to obtain information of the status of the device, an inquiry is  
5 made about current status of the device, and information as the result of inquiry is combined with the video image obtained by the camera.

The management of information, for determining whether or not the device is included in the view, is  
10 made by pre-storing the management table as shown in Fig. 15 into a predetermined storage device (e.g., a hard disk device), and using this table. In the management table, the first column shows objects of management such as a copier and a printer (by network address or ID).  
15 The second column shows positions of the devices. In this example, each position is specified with a floor of a building where the device is placed and 3-dimensional coordinates (unit: cm) in the floor. The third column shows the sizes of the devices (unit: cm). For example,  
20 the first row indicates that a device with an identifier "printer#231" is placed at a position, away from the center of north 4th floor as the origin coordinates, by 300 cm in a south-north direction and 450 cm in an east-west direction, and 100 cm above from the floor, and  
25 that the size of the device is 30 (length) × 80 (width) × 75 (depth) cm.

More specifically, the command interpreter is extended as follows, and a video-image process unit 7020 is added in correspondence with the extended command interpreter. The operation of the present embodiment will be described with reference to the flowchart of Fig. 12.

First, at step S701, the contents of a command is interpreted as follows to predict the view of image sensing.

First, in accordance with the control structure of the control information, control items to be performed are read. Next, the obtained control items are interpreted, and a view in a case where the camera 1003 is provided with the control content is predicted. Then, it is determined whether or not the device registered in the management table shown in Fig. 17 such as a copier is included in the view.

Finally, if the device is included in the view, the controller 1001 performs communication with the object device and obtains status information on the object device stored in a status information memory 7021. The status information stored in the status information memory 7021 is, for example, as follows:

("copier#445" client:Kurosawa printing "80%" "1 copy, page 23, double-sided")

Next, at step S101, the command described as a file name is interpreted. That is, if the head of the command is "P", it is recognized as an image-sensing  
5 command, then the process proceeds to step S102. At step S102, the camera is controlled via the camera controller 1017 to operate with designated pan, tilt and zoom values (step S102), and an image obtained by the image sensing is converted into an image of a designated image  
10 format.

Thereafter, at step S702, video image combining is performed. That is, the position of the object device in the video image is calculated from the control information when sensing the video image, an image is  
15 generated based on status information in the status information memory 7021, around the object device in the video image, and the image is combined with the video image. The result of combining is as shown in Figs. 14A to 14D.

20 Then, the result of combining is returned via the communication interface unit 1011 to the external device 1002 requiring the video image (step S103). At this time, as the communication interface unit 1011 uses the HTTP protocol, content-type information and status  
25 information corresponding to the image format are added to the head of the image data. Then, the process ends.

Thus, the video image obtained by image sensing is pasted in an HTML document and displayed as if it is image data stored in a file in the WWW server.

In the command interpretation at step S101, if the  
5 head of the request is "R", the command is recognized as a reservation command. Then, the process proceeds to step S105 via the determination of image-sensing condition at step S104. The reservation command, which is used as described above, starts with "R"; then it  
10 continues with integers indicating year, month, day, hour, and minute, each terminated with a period, and with designation of panning, tilting and zooming as image-sensing condition; finally it ends with a name indicating the image format. For example, if video-image  
15 sensing is programmed with image-sensing time of 13:15 on July 6, 1996, a pan angle of 25°, a tilt angle of 0° and a 3 times zooming, in gif format, the reservation is described as follows:

20 

When the above reservation command is designated, a unique identification number as an acceptance code is received from the acceptance code generator 1013, at  
25 step S105. The acceptance code may be a count value which is incremented by one (+ 1) at each request

generated, or may be a numerical value indicating the designated time (year, month, date and time). Then, the acceptance code, the image-sensing time, the image-sensing condition and the image format are registered  
5 into the reservation register 1014 (step S106). The acceptance code is returned via the communication interface unit 1011 to the external device 1002 which issued the reservation command (step S107).

Note that at this time, content-type information  
10 and status information, indicating that the response is an acceptance code, are added to the head of the code. Then the process ends.

However, if an HTML document including such image-sensing reservation is simply generated but a general  
15 WWW browser is used to display the obtained image, the acceptance code instead of image data is returned and an image is not displayed. However, if image-sensing is reserved with respect to the camera control apparatus 1001 by using a CGI program or the like of the WWW  
20 server, in the same manner as that in the WWW browser, and after an acceptance code has been obtained, an HTML document is generated with image-data description designating the acceptance code by an image read command to be described later, image sensing can be performed as  
25 programmed when the document is displayed by the WWW browser, and the image data can be displayed.

Note that the image read command starts with alphabet "G", then continues with the acceptance code, and ends with the extension indicating the image format. The acceptance code is returned to the external device  
5 1002 upon reservation.

For example, if "12543" is returned as an acceptance code, to read the image obtained by programmed image sensing, the following description is used:

10

```

```

The reservation register 1014 is realized in the format of a table, for example, as shown in Fig. 3, into  
15 a memory device of the controller 1001 or the auxiliary storage device.

For example, in the above reservation, when the acceptance code is "12543", the contents of the reservation is described as the first row of the table  
20 in Fig. 3.

When the reservation has been registered, image sensing as programmed is performed at the image sensing time, based on the timer to be described later. The image data is stored in the image memory 1019.

25 The image memory 1019 is realized in the format as shown in Fig. 4, for example, in the memory device of

the controller 1001 or the auxiliary storage device (e.g., a hard disk). For example, the result of image sensing by the above reservation is recorded, as image data of the designated format, with the acceptance code and image format information, in the first row of the  
5 table in Fig. 4.

In the command interpretation at step S101, if the head of the command is "G", it is determined that the command is an image read command. The process proceeds  
10 via determination at steps S104 to S108 to step S109, at which data stored in the image memory 1019 is searched.

Then, it is determined whether or not the data obtained by the above search has the same value of the acceptance code described as the image read command  
15 (step S110). If YES, the image data is read, and transferred via the communication interface unit 1011 to the external 1002 requesting the image data. Also at this time, as the communication interface unit 1011 uses the HTTP protocol, content-type information and status  
20 information corresponding to the image format are added to the head of the image data (step S111).

At step S112, the image data in the storage area of the image memory 1019, from which the image data has been read out, is deleted. Then the process ends.

25 If it is determined at step S110 that image data corresponding to the designated acceptance code is not



stored, error information indicating that the programmed image sensing has not been performed is returned via the communication interface unit 1011 to the external device 1002 requesting the image data. Then the process ends.

5           Further, if it determined at step S108 that the head of the command from the external device 1002 is not "G", error information indicating that the command is an undefined command is returned via the communication interface unit 1011 to the external device 1002  
10 requesting the image. Then the process ends.

As described above, information exchange is performed between the external device 1002 and the camera control apparatus 1001 of the present embodiment.

Next, the timer 1015, used for performing camera  
15 control and storing the result of image-sensing, based on reservation data registered in the reservation register 1014, will be described.

In the timer 1015, at intervals of a predetermined period, e.g., one minute, a timer program is activated.  
20 This program is realized by utilizing a timer of a computer or the like.

The operation of the timer program will be described with reference to the flowchart of Fig. 13. First, the current time is read from a timer of the  
25 camera control apparatus 1001 (step S201), and the process proceeds to step S202. At step S202, reserved

contents, i.e., items of programmed image sensing sequentially registered in a respective row of the table of the storage device are read from the reservation register 1014. When it is determined at step S203 that  
5 all the items of programmed image sensing have been read out, the process ends, otherwise, the process proceeds to step S204. At step S204, if it is determined that the designated time in the reserved data is in the future, the process returns to step S202 to repeat the  
10 processing. On the other hand, if it is determined at step S204 that the designated time has come, the process proceeds to step S205, at which the camera 1003 is controlled to perform image sensing, by the camera controller 1017, in accordance with the image-sensing  
15 condition of the items of the programmed image sensing read from the reservation register 1014.

Thereafter, at step S703, video image combining is performed. That is, the position of the object device is calculated from the control information upon image  
20 sensing to obtain the video image, and status information obtained by communication is combined with the video image at a position around the object device in the video image. The result of combining is, for example, as shown in Figs. 14A to 14D.

25 Then, the combined image is converted into image data of the image format designated by a corresponding

item of the programmed image sensing. The image data is stored, with an acceptance code and image format information, into the image memory 1019 (step S206). Next, the read items of programmed image sensing are  
5 deleted from the reservation register 1014 (step S207), and the process returns to step S202 to repeat the processing.

In this manner, image sensing is performed as programmed, and the result of the image sensing is  
10 stored. Thereafter, when an image read command is sent from the external device 1002, the image data is returned in response to the command.

As a result, the client can obtain the video image obtained by controlling the camera of the remote camera  
15 server, and also can check time transitional state of a pre-registered object (an integrated copier in the above example).

Accordingly, when a client performs printing, the client can confirm whether or not the printer is  
20 performing the print job, and further confirm the percentage of the completion of the print job.

Note that the present embodiment has been described as an example where an image indicating the status of a copier is combined with a displayed video  
25 image, however, this may be applied to any other OA (Office Automation) device such as a facsimile apparatus

or a printer, or an AV (Audio Visual) device.

Further, in the present embodiment, the annotation of the status of the object device is simply combined with the displayed video image, however, more detailed  
5 annotation can be combined by zooming.

Further, the present embodiment has been described as an example where a device such as a copier is on-line connected via an information network, however, more simple construction without on-line connection can be  
10 made by preparing a management table as shown in Fig. 16. That is, the information in a fourth column as "annotation" items in the management table in Fig. 16 is directly combined with video image information. Further, another program to arbitrarily change the item  
15 "annotation" in the fourth column in Fig. 16 can be easily prepared.

Especially, when the camera server of the present embodiment is placed near a sightseeing spot or the like, on the Internet, if annotations are added to respective  
20 sightseeing objects to a video image, the sightseeing on the WWW browser is indexed, which is convenient.

Note that in some cases, such annotation or the like is obstructive for a viewer. Accordingly, it may be arranged such that a button to instruct to/not to  
25 display the annotation information is displayed on the WWW browser, and whether the annotation should be

combined to a displayed image or not is determined based on whether or not the button has been pressed.

Further, in this case, the annotation video image may be combined by the server side or by the client side.

5 If the combining is made by the server side, whether or not the annotation image should be combined is determined in accordance with an instruction from the client. Further, if the combining is made by the client side, it may be arranged such that information on the  
10 annotation and information on the object (information as shown in Fig. 16) are transferred to the client, and when the user on the client side instructs to display the annotation, a program on the browser performs display based on the information.

15

<Second Embodiment>

In this embodiment, similar to the first embodiment, a camera server set in an office inputs control information such as zoom, pan, tilt values or  
20 the like from an input unit, controls a camera in accordance with the control information to perform image sensing, and adds additional value to a video image obtained the image sensing, however, the video-image process unit of the second embodiment differs from that  
25 of the first embodiment.

Especially, in the second embodiment, desks of the

staff members in the office are included in the video image of the office to be outputted. If a staff member is absent because the staff member is at a meeting or the like, a video image of a meeting room or the like is  
5 combined with the output video image by superimposing.

The second embodiment uses a management table as shown in Fig. 17 in place of the management table in the first embodiment. In the table in Fig. 17, the first column shows the staff members as objects. The second  
10 column shows desk positions of the object staff members. In this example, the desk position of each staff member is specified by a floor number of a building and three-dimensional coordinates (unit: cm) on the floor. The third column shows current positions of the staff  
15 members. The fourth column shows identifiers of cameras set around the current positions of the staff members. For example, in a case where a staff member with an identifier "Kurosawa" has a desk at a position on the north fourth floor of the building, and away from the  
20 center of the floor as the origin coordinates by 300 cm in a south-north direction, 450 cm in a east-west direction, and 10 cm from the floor, if this staff member is in a meeting room 191, the situation in the meeting room 191 can be image-sensed by a camera with an  
25 identifier "camera#249".

To realize this image sensing, steps S701 to S703

in the description of the operation of the camera server according to the first embodiment are changed as follows.

· Change step S701 to step S711. At step S711, the control content is interpreted as follows, and the view  
5 of image sensing is predicted.

"The obtained control items are interpreted and the view of image sensing, if the camera is provided with the control content, is predicted. It is determined whether or not the view includes the desk of the staff  
10 member registered in the management table 22 and there is a camera around the current position of the staff member. Next, if it is determined that there is a camera around the current position of the staff member, arrangement is made to receive a video image obtained by  
15 the camera. This camera is called a second camera."

· Change step S702 to video-image combining step S712 as follows. Similarly, change step S703 to step S713, to perform the following video-image combining operation.

"The desk position of the object staff member is  
20 calculated from the control information, and the video image obtained by the second camera is superimpose-combined with the video image to be outputted at a position around the desk in the video image."

In this example, in addition to simple video  
25 image information service, video image information with a high additional value can be generated, by

interpreting the control information supplied to the video image input unit and predicting a video image obtained by the video image input unit.

In the present embodiment, the positions of the staff members can be fixedly determined by the management table, however, it is easily considered to construct a system where the respective staff members have a radio communication device to indicate their positions, and the current positions of the staff members are automatically tracked and video images around them are obtained.

Further, it is easily considered to provide a video image with additional value by video image process as described above, together with the video image process described in the first embodiment.

In this case, the type of video image process, or a video-image combining method and the like are designated as parameters of a video-image transfer request from a viewer, and the designation is interpreted by the camera server system, so as to prevent complication of a video image resulted from the process.

As described above, according to the present embodiment, it is possible to confirm the details of an object, apart from the object as a video image. Thus, a video image service with a high additional value can be



provided.

#### <Third Embodiment>

Next, a third embodiment will be described.

5 Similar to the above first and second embodiments, the third embodiment displays status information of an object in a video image obtained by a remote camera. Especially, the third embodiment displays more detailed information of the object if the object is clicked by a  
10 pointing device such as a mouse.

Fig. 18 is a block diagram showing the construction of the camera controller 1001 according to the third embodiment. The difference from Fig. 11 of the first embodiment is that an anchor generator 7031 and an  
15 anchor interpreter 7032 are added to the construction. When an object in video image information transferred to a WWW browser (client) is clicked, the anchor generator 7031 generates a command to inform the camera controller 1001 of that status. The anchor interpreter 7032  
20 interprets the command when it receives the command from the WWW browser.

The other elements are substantially the same as those in Fig. 11, and the operations of these elements will be apparent from the following description.

25 The external device 1002 is a WWW server or a WWW browser, for example, and performs communication by

using the HTTP protocol. That is, a WWW browser sends a request in accordance with a URL indicating the storage destination of desired data to a WWW server which is a storage of document data and image data. In response to  
5 the request, the WWW server returns corresponding document data or image data to the WWW browser.

The copier system 1007 is a copier having a network interface. The copier system 1007 returns status information on current status of the copier in response  
10 to a status information request via communication. For example, if the identifier (name) of this copier is "copier\_445" and it is printing when it receives a status information request, it returns status information as follows, including printing-progress  
15 status and printing settings:

"copier\_445" client:Kurosawa printing "80%" "1 copy,  
page 23, double-sided"

20 "client: Korosawa" indicates the name of the client (or ID) that issued the present print job on the network. Note that "Kurosawa" who ordered printing, "1 copy" and "double-sided" depend on the print job, but "80%" and "page 23" vary with time. Further, the items  
25 of the returned information are not limited to above items but may be any other information. For example, if

there is no print sheet and printing cannot be performed, information indicating this status is included in the information.

Note that the copier system 1007 also functions as  
5 an ordinary printer and a image scanner. Further, as it is impossible to return the above status if the total number of pages in one print job is unknown, the copier system 1007 has an external storage device with a capacity large enough to store a queue of print jobs,  
10 such as a hard disk or the like. Further, when the copier system 1007 comprises a single copier, the above external storage device is necessary, however, if the copier system 1007 comprises a general-purpose device such as a personal computer and a device having only  
15 printing, copying and image reading functions, the general-purpose device manages the respective jobs. Accordingly, as the function to manage the jobs is realized by an external device and a program for performing the processings of the external device, the  
20 function may be provided in the controller 1001.

In the present embodiment, the communication interface unit 1011 is realized by a WWW server. That is, communication is performed by using the HTTP protocol, and the controller 1001 behaves as if it is a WWW server  
25 in application of video data. This can be realized if the controller 1001 also uses the communication method

for the WWW server.

<Procedure>

Although most of the operation procedures  
5 according to the present embodiment are the same as  
those in the first embodiment, the procedure will be  
sequentially described for the sake of deeper  
understanding of the present embodiment.

The external device 1002 requires video  
10 information by issuing the following description in  
accordance with the procedures in the above-described  
first to sixth examples:

\$ (pan=0,upto180,up10) P\$ (pan) T0Z2

15

The address of the controller 1001 corresponding  
to the camera 1001 (temporarily "camera\_122"), requires  
a video image, is "www.camera122.foo.co.jp", and time to  
require a video image is "from 13:00 to 13:18, at 1-  
20 minute intervals, on November 11, 1996", the above  
request is described as follows in one line.

Http://www.camera122.foo.co.jp/R\$ (pan=0,upto180,up10) 199  
6.11.11.13.0t1996.11.11.13.18e1\$ (pan) T0Z2.mpg

25

On the other hand, the camera controller 1001

operates as follows.

Similar to the above-described first to sixth examples, the controller 1001 controls the camera 1001 to operate in accordance with the control information  
5 and perform image sensing. Note that if it is determined that a device such as a copier is included in the view (a management table, containing angle information on an angle including the copier, is stored into a predetermined storage device in advance), to obtain  
10 information of the status of the device, an inquiry is made about current status of the device, and explanation of the obtained information as anchor is combined with the video image obtained by the camera.

The management of information for determining  
15 whether or not the device is included in the view is made by pre-storing a management table as shown in Fig. 17 into a predetermined storage device (e.g., a hard disk device), and referring to this table. The content of the management table is as described above.

20 More specifically, the command interpreter is extended as follows, and a video image adder 7020, the anchor generator 7031, the anchor interpreter 7032 are added in correspondence with the extended command interpreter. Next, the operation of the present  
25 embodiment will be described with reference to the flowchart of Fig. 19.

First, at step S701, the control content from the WWW browser is interpreted as follows and the view of image sensing is predicted.

First, in accordance with the control structure of  
5 the control information, control items to be performed are read. Next, the obtained control items are interpreted, and a view in a case where the camera 1003 is provided with the control content is predicted. Then, it is determined whether or not the device registered in  
10 the management table shown in Fig. 17 such as a copier is included in the view.

If the device is included in the view, communication is performed with the object device and status information stored in a status information memory  
15 7021 is obtained. The status information stored in the status information memory 7021 is, for example, as follows:

("copier\_445" client:Kurosawa printing "80%" "1 copy,  
20 page 23, double-sided")

Next, at step S101, the command described as a file name is interpreted. That is, if the head of the command is "P", it is recognized as an image-sensing  
25 command, then the process proceeds to step S102. The camera controller 1017 is controlled to operate the

camera with designated pan, tilt and zoom values (step S102), and an image obtained by the image sensing is converted into an image of a designated image format.

Thereafter, at step S702, video image combining is performed. That is, the position of the object device in the video image is calculated from the control information when sensing the video image, an image is generated based on status information in the status information memory 7021, around the object device in the video image, and the image is combined with the video image. The result of combining is as shown in Figs. 14A to 14D.

Next, the process proceeds to step S802, an anchor is generated by combining, similar to clickable mapping method "imagemap" generally used on the www. That is, as interpreter when an object video image is clicked, the anchor interpreter 7032 is set as follows:

```
<a href="http://www.xxx.co.jp/cgi-  
bin/imagemap/camera122.map">  
<embed SRC=camera122.wvp width=290 height=179></embed>  
</a>
```

Then, an area of video image combining is added to a management information file of the clickable map, and as a link destination, a "copier management page" obtained

by communication with the object device is set.

More specifically, the status information in the status information memory 7021, obtained by communication, is used to set link information in the  
5 "copier management page" as follows:

[http://www.foo.co.jp/netdevices/copier\\_445/snmp.html](http://www.foo.co.jp/netdevices/copier_445/snmp.html)

Then, the area where the status information is combined  
10 (relative position in the video image) is formed to have a rectangular shape with an upper-left vertex (15,8) and a lower-right vertex (135,39). Thereafter, information as follows is written in the management information area of the clickable map:

15

rect

[http://www.foo.co.jp/netdevices/copier\\_445/snmp.html](http://www.foo.co.jp/netdevices/copier_445/snmp.html)

15,8 135,39

20       Thereafter, the result of combining is returned via the communication interface unit 1011 to the external device 1002 requiring the video image (step S103).

At this time, as the communication interface unit  
25 1011 uses the HTTP protocol, content-type information and status information corresponding to the image format



are added to the head of the image data. Then, the process ends.

Thus, the obtained video image is pasted in the HTML document as if it is image data stored in a file in the WWW server. Further, if a user clicks the combined image portion (around the copier) by a mouse or the like, the display is changed to the "copier management page" display.

For example, if the above file  
10 "www.foo.co.jp/netdevices/copier\_445/snmp.html" is generated as a hyper-text file as shown in Fig. 24 (the format is visible in the browser display in Fig. 24), the content of Fig. 24 is displayed only when the user of the client clicks the displayed image around the  
15 copier.

In the command interpretation at step S101, if the head of the request is "R", the command is recognized as a reservation command. Then, the process proceeds to step S105 via the determination of image-sensing  
20 condition at step S104.

The reservation command is used for a service to make reservation of image sensing, and later transfer an obtained video image to a client. The reservation command starts with "R"; then it continues with integers  
25 indicating year, month, day, hour, and minute, each terminated with a period, and with designation of

panning, tilting and zooming as image-sensing condition;  
finally it ends with a name indicating the image format.  
For example, if video-image sensing is programmed with  
image-sensing time of 13:15 on July 6, 1996, a pan angle  
5 of 25°, a tilt angle of 0° and a 3 times zooming, in gif  
format, the reservation is described as follows:

```

```

10       When the above reservation command is designated,  
a unique identification number as an acceptance code is  
received from the acceptance code generator 1013 at step  
S105. The acceptance code may be a count value which is  
incremented by one (+ 1) at each request generated, or  
15 may be a numerical value indicating the designated time  
(year, month, date and time).

Then, the acceptance code, the image-sensing time,  
the image-sensing condition and the image format are  
registered into the reservation register 1014 (step  
20 S106). The acceptance code is returned via the  
communication interface unit 1011 to the external device  
1002 which issued the reservation command (step S107).

Note that at this time, content-type information  
and status information, indicating that the response is  
25 an acceptance code, are added to the head of the code.  
Then the process ends.

However, if an HTML document including such image-sensing reservation is simply generated but a general WWW browser is used to display the obtained image, the acceptance code instead of image data is returned and an  
5 image is not displayed. However, if image-sensing is reserved with respect to the camera control apparatus 1001 by using a CGI program or the like of the WWW server, in the same manner as that in the WWW browser, and after an acceptance code has been obtained, an HTML  
10 document is generated with image-data description designating the acceptance code by an image read command to be described later, image sensing can be performed as programmed when the document is displayed by the WWW browser, and the image data can be displayed.

15 Note that the image read command starts with alphabet "G", then continues with the acceptance code, and ends with the extension indicating the image format. The acceptance code is returned to the external device 1002 upon reservation.

20 Similar to the previous embodiment, if "12543", for example, is returned as an acceptance code, to read the image obtained by programmed image sensing, the following description is used:

25 

The reservation register 1014 is stored in the format of a table, for example, as shown in Fig. 3, into a memory device of the controller 1001 or the auxiliary storage device. For example, in the above reservation, 5 when the acceptance code is "12543", the contents of the reservation is described as the first row of the table in Fig. 3.

When the reservation has been registered, image sensing as programmed is performed at the image sensing 10 time, based on the timer to be described later. The image data is stored in the image memory 1019.

The image memory 1019 is realized in the table format as shown in Fig. 4, for example, in the memory device of the controller 1001 or the auxiliary storage 15 device (e.g., a hard disk). For example, the result of image sensing by the above reservation is recorded, as image data of the designated format, with the acceptance code and image format information, in the first row of the table in Fig. 4.

20 In the command interpretation at step S101, if the head of the command is "G", it is determined that the command is an image read command. The process proceeds via determination at steps S104 to S108 to step S109, at which data stored in the image memory 1019 is searched.

25 Then, it is determined whether or not the data obtained by the above search has the same value of the

acceptance code described as the image read command  
(step S110). If YES, the image data is read, and  
transferred via the communication interface unit 1011 to  
the external 1002 requesting the image data. Also at  
5 this time, as the communication interface unit 1011 uses  
the HTTP protocol, content-type information and status  
information corresponding to the image format are added  
to the head of the image data (step S111).

At step S112, the image data in the storage area  
10 of the image memory 1019, from which the image data has  
been read out, is deleted. Then the process ends.

If it is determined at step S110 that image data  
corresponding to the designated acceptance code is not  
stored, error information indicating that the programmed  
15 image sensing has not been performed is returned via the  
communication interface unit 1011 to the external device  
1002 requesting the image data. Then the process ends.

Further, if it determined at step S108 that the  
head of the command from the external device 1002 is not  
20 "G", error information indicating that the command is an  
undefined command is returned via the communication  
interface unit 1011 to the external device 1002  
requesting the image. Then the process ends.

As described above, information exchange is  
25 performed between the external device 1002 and the  
camera control apparatus 1001 of the present embodiment.

Next, the timer 1015, used for performing camera control and storing the result of image-sensing, based on reservation data registered in the reservation register 1014, will be described.

5           In the timer 1015, at intervals of a predetermined period, e.g., one minute, a timer program is activated. This program is realized by utilizing a timer of a computer or the like.

          The operation of the timer program will be  
10 described with reference to the flowchart of Fig. 20.

          First, the current time is read from a timer of the camera control apparatus 1001 (step S201), and the process proceeds to step S202. At step S202, reserved contents, i.e., items of programmed image sensing  
15 sequentially registered in a respective row of the table of the storage device are read from the reservation register 1014. When it is determined at step S203 that all the items of programmed image sensing have been read out, the process ends, otherwise, the process proceeds  
20 to step S204. At step S204, if it is determined that the designated time in the reserved data is in the future, the process returns to step S202 to repeat the processing. On the other hand, if it is determined at step S204 that the designated time has come, the process  
25 proceeds to step S205, at which the camera 1003 is controlled to perform image sensing, by the camera

controller 1017, in accordance with the image-sensing condition of the items of the programmed image sensing read from the reservation register 1014.

5       Thereafter, video-image combining is performed at step S703. That is, the position of the object device in the video image is calculated from the control information upon image sensing, and an image is combined around the object device in the video image, based on the status information stored in the status information  
10       memory 7021 as described above. As the result of combining is similar to that at the above-described step S702, the explanation of the result will be omitted. Further, as the anchor generating processing at step S803 is similar to step S802, the explanation of this  
15       processing will be omitted. The result of combining is as shown in Fig. 14.

      Then, the obtained image is converted into image data of the image format designated by a corresponding item of the programmed image sensing. The image data is  
20       stored, with an acceptance code and image format information, into the image memory 1019 (step S206). Next, the read items of programmed image sensing are deleted from the reservation register 1014 (step S207), and the process returns to step S202 to repeat the  
25       processing.

      In this manner, image sensing is performed as

programmed, and the result of the image sensing is stored. Thereafter, when an image read command is sent from the external device 1002, the image data is returned in response to the command.

5           As a result, the client can see a video image obtained by controlling a camera of the remote camera server, and can confirm the realtime changing status of a pre-registered object (the integrated copier in the above example). Further, on the client side, when a  
10 particular position in the displayed video image is clicked, if an anchor is provided at the position, the content information at the position can be obtained.

          Note that the present embodiment has been described as an example where the status of a copier is  
15 combined with a video image, however, this is applicable to any other, OA devices such as a facsimile and a printer or other AV devices.

          Further, in the present embodiment, only one anchor is combined within a video image, however, it can  
20 be understood that a plurality of anchors can be represented within one video image by writing a plurality of information in management information of a clickable map. For example, a plurality of management information for the clickable map are as follows:

25

rect [http://www.foo.co.jp/netdevices/copier\\_445](http://www.foo.co.jp/netdevices/copier_445)



/snmp.html 15,8 135,39  
rect  
http://www.foo.co.jp/netdevices/facsimile\_28/snmp.html  
20,18 55,39  
5 rect  
http://www.foo.co.jp/netdevices/colorprinterr\_4/snmp.htm  
1 55,21 135,39  
rect  
http://www.foo.co.jp/netdevices/printer\_266/snmp.html  
10 15,8 135,39

Further, in the present embodiment, when the device such as a copier is on-line connected to a network, the management information of the device is  
15 accessed as a hyper text, however, the information are more directly related by preparing a management table as shown in Fig. 23. That is, in the management table in Fig. 23, the information in the fourth column "URL" is used as link destination for the anchor.

20

Note that it can be easily understood that prepare another program may be prepared to arbitrarily change the link destination item in the fourth column in Fig. 23.

25

The present embodiment has been described as an example where a www URL is overlapped with an anchor,

however, the www URL can also be overlapped with an anchor of another format.

<Fourth Embodiment>

5           In a fourth embodiment, similar to the third embodiment, a camera server placed in an office receives control information such as zoom, pan and tilt values and the like from an input device, and controls a camera based on the control information to perform image  
10 sensing, thus provide a video image obtained by the image sensing with additional value, however, the video-image process unit of the fourth embodiment is different from that of the third embodiment.

          Especially, in the present embodiment, a video  
15 image to be output includes desk positions of staff members of the office, and when a staff member is absent because the staff is at a meeting or the like, a video image of a meeting room or the like is superimposed over the output video image.

20           In this example, as shown in Fig. 21, the video-image process unit 7020, the anchor generator 7031 and the anchor interpreter 7032 of the third embodiment are replaced with an extended video-image process unit 7120, an extended anchor generator 7131, an extended anchor  
25 interpreter 7132. By using these units, anchor information is directly added to video image information

and transferred to a client.

The operation of the extended video-image process unit 7120 is substantially the same as that of the video-image process unit 7020 except that the video-  
5 image process unit 7120 adds anchor information called "anchor script", generated by the extended anchor generator 7131, to video image information, resulted from image combining in the third embodiment.

Further, the client side has a function to  
10 interpret an anchor script, received by using the extended anchor interpreter 7132, and find an appropriate link destination, upon detection of click operation, in addition to the simple interpretation of video data. To provide the extended anchor interpreter  
15 7132 to the client, a plug-in function, a helper application or the like may be employed.

The extended anchor generator 7131 generates an appropriate anchor script from a predicted view of a video image resulted from interpretation of control  
20 content, position information of the respective devices, and the link destination information in the management table as shown in Fig. 23.

Next, the operation of the present embodiment will be described.

25 To realize the above operation, steps S702 and S802 in the description of the camera controller in the

third embodiment are replaced with steps S702' and S802' as follows:

· Step S702'

First, video image combining is performed in accordance  
5 with step S702, and an anchor script generated by the extended anchor generator 7131 is added to the video information.

· Step S802'

First, similar to step S701, the view of image  
10 sensing is predicted from the interpretation of the control content. Next, an anchor script as follows is generated from the predicted view of image sensing and the position information and link destination information of the respective devices in the management  
15 table as shown in Fig. 18. Then an anchor having a name "a1" is generated with a link destination as follows:

"http://www.foo.co.jp/netdevices/copier\_445/snmp.html"

20 The anchor is combined with a rectangular area having an upper-left vertex (15,8) and an lower-right vertex (135,39) as follows:

<anchors>

25 <a

href="http://www.foo.co.jp/netdevices/copier\_445/snmp.ht

```
ml">a1</a>
  <embed a=a1 range=15,8+135,39></embed>
</anchors>
```

5           In the present embodiment, as well as simple  
video-image information service, control information  
supplied to the video-image input unit is interpreted  
and a video image obtained by the video-image input unit  
in advance is predicted, so as to generate video image  
10 information with higher additional value.

Similar to the third embodiment, the fourth  
embodiment has been described as an example where only  
one anchor is combined within a video image, however, it  
is understood that a plurality of anchors can be easily  
15 represented in one video image by extending an anchor  
list. For example, it can be considered to generate an  
anchor list as follows:

```
<anchors>
20   <a
href="http://www.foo.co.jp/netdevices/copier_445/snmp.ht
ml">a1</a>
    <a
href="http://www.foo.co.jp/netdevices/facsimile_28/snmp.
25 html">a2</a>
    <a
```

```

href="http://www.foo.co.jp/netdevices/colorprinter_4/snm
p.html">a3</a>
  <a
href="http;://www.foo.co.jp/netdevices/printer_266/snmp.
5  html">a4</a>
    <embed a=a1 range=5,8+15,19></embed>
    <embed a=a2 range=20,18+35,39></embed>
    <embed a=a3 range=55,21+135,39></embed>
    <embed a=a4 range=30,30+135,45></embed>
10 </anchors>

```

Further, in the anchor script described in the present embodiment, the position of the anchor in a video image is specified by using two-dimensional coordinates such as "range=15,8+135,39", however, it may be specified by using a simple fractional representation. For example, as shown in Fig. 22A, in a video image divided into four areas, a first quadrant (upper-right area) is specified as "range=1/4". Similarly, as shown in Fig. 22B, in a video image divided into nine areas, numbers are allotted to the areas from an upper-left area, and for example, the sixth area is specified as "range=6/9".

Further, the present embodiment has been described as an example where anchor information is added to each of images in a video image, however, it is possible to

improve efficiency of the operation by adding anchor information with respect to one scene, as follows:

```
<anchors>
5   <a
    href="http://www.foo.co.jp/netdevices/copier_445/snmp.html">a1</a>
    <a
    href="http://www.foo.co.jp/netdevices/facsmile_28/snmp.html">a2</a>
10  <a
    href="http://www.foo.co.jp/netdevices/colorprinter_4/snmp.html">a3</a>
    <a href="http://www.foo.co.jp/netdevices/printer_266
15  /snmp.html">a4</a>
    <embed a=a1 scene=132714+50 range=5,8+15,19></embed>
    <embed a=a2 scene=132730+20 range=20,18+35,39></embed>
    <embed a=a3 scene=132720+40 range=55,21+135,39></embed>
    <embed a=a4 scene=132714+50 range=30,30+135,45></embed>
20 </anchors>
```

In the above-described third and fourth embodiments, display is made by remote-operating an object having status which varies with time (copier in the fourth embodiment), however, regarding an object with fixed status, it is not necessarily connected to a

network, and further, does not necessarily operate electrically.

For example, it may be arranged such that in a case where a video image in an office is displayed, when  
5 a desired desk is clicked, information on the user of the desk is displayed.

Further, in the above-described third and fourth embodiments, when an object (copier) is included in the view of a camera, the status information of the object  
10 is combined with a video image obtained by the camera, and if the object is clicked, more detailed information on the object is displayed. However, it may be arranged such that the status information and the more detailed information are displayed when they are clicked.

15 As described above, according to the third and fourth embodiment, in addition to the service to providing an object as a video image, a video image is appropriately processed with the video image as material, thus a video image service with higher additional value  
20 can be provided.

#### <Fifth Embodiment>

The present invention provides a technique applicable to a system where a camera, connected to an  
25 information network, for example, is controlled from a remote client, and a video image obtained by the camera



is sent to the client via the network, thus the video image can be monitored on the client side.

The basic technique relating to the above purpose is as disclosed in Japanese Patent Application Laid-Open  
5 No. 8-193729, and a part of the present invention utilizes this technique.

Further, in the following embodiment, with respect to a video image obtained by a remote camera, an explanatory image of the video image is combined with  
10 the video image. The basic technique relating to this purpose is similar to that of the first embodiment.

In the following fifth embodiment, a portion not especially explained is application of the above basic technique.

15 Next, the fifth embodiment as an example of the present invention will be described with reference to the drawings.

In the fifth embodiment, a video image obtained and provided by the remote camera server side (a camera  
20 101 and a server controller 102 in Fig. 25) is referred to by a client terminal (a client controller 107 in Fig. 25) on the user side.

Especially, in the fifth embodiment, the camera  
101 image-senses a scene of a city, and an annotation  
25 (character string) on the obtained video image is combined with the video image and the combined image is

displayed.

The present invention is applicable to a system comprising a camera server, at least one client terminal for the camera server and a network connecting them.

5 Hereinbelow, the construction of a system using one camera server and a plurality of client terminals will be described with reference to Fig. 25.

In Fig. 25, numeral 101 denotes a camera controlled based on a control signal indicative of the  
10 camera angle, image-sensing condition and the like, supplied via a connection line 101-a. The camera 101 real-time outputs data on an obtained video image via a connection line 101-b.

Numeral 102 denotes a server controller which  
15 controls the camera 101 based on the control signal transmitted from a client controller to be described later via a network line. Note that the camera 101 and the server controller 102 are generally called a camera server. The server controller 102 comprises so-called  
20 personal computer or the like.

Further, the server controller 102 may receive a video image transmitted from the camera 101 and transmit the received video image to a plurality of client controllers via the network line.

25 The specific construction of the server controller 102 will be described below.

Numeral 103 denotes a camera controller which controls the camera 101 via the connection line 101-a (RS232C interface or the like). The camera controller 103 obtains camera control information, transmitted from  
5 a client controller 107 to be described later and inputted via the network line and a communication interface unit 105, interprets the camera control information, and controls the camera 101 based on the control information. Note that the camera control  
10 information in this embodiment is information to be transmitted among the respective devices to control the camera 101.

Numeral 104 denotes a video-image input unit such as an image capture device, which inputs a video image  
15 obtained by the camera 101 via the connection line 101-b.

The communication interface unit 105 is a network adapter which performs image information communication, audio information communication, and communication of various types of control information with an external  
20 device (the client controller 107 or the like) connected via the network line. The network adapter is called communication interface unit.

Further, the server controller 102 has a CPU for controlling the operations of respective units in the  
25 device and necessary calculation, and storage devices such as a ROM, and a RAM. The server controller 102

stores programs and various parameters into the storage devices.

Numeral 106 denotes a World Wide Web server (hereinafter referred to as "HTTP server") which returns  
5 necessary image information, audio information and the like to a home page on the Internet or the like, in response to a request from the client controller.

The HTTP server 106 holds combining condition for combining a video image from the camera 101 with an  
10 annotation (explanation of the video image, or characters or an image indicating the state of the video image or the like), an annotation image, character information and the like, stored in advance in a memory 106a.

15 Next, the client controllers 107 which receive image and audio information via the network line from the above-described camera server, and display a home page on the Internet based on the received information will be described.

20 The client controller 107 obtains image information and camera control information from the server controller 102, and displays appropriate information on a monitor in accordance with an operation input from a user.

25 Similar to the server controller 102, the client controller 107 mainly comprises a personal computer.

The basic construction of the client controller 107 will be described.

Numeral 108 denotes a network adapter having a function similar to that of the communication interface unit 105. The network adapter 108 is also called communication interface unit. The communication interface unit 108 transmits various information with an external device on the network.

Numeral 109 denotes a web browser (hereinafter simply referred to as "browser") which displays image and audio information outputted from the HTTP server, and executes an applet program sent from the server controller 102. Note that in practice, the browser operates by using a CPU and a ROM or RAM in which a necessary program or the like is stored, in the browser.

Next, the communication operation by using the respective devices in Fig. 25 will be described with reference to Fig. 26.

In Fig. 26, a user on the client controller 107 side first activates the browser 109 of the user's device. Numeral 110 denotes a display for displaying a home page on the Internet when the browser 109 is activated. When the browser is activated, the display 110 displays an image as shown in Fig. 26, then, the user inputs a character string such as "http://www.foo.co.jp/" at a position 110-b, and refers

to a home page issued by the server controller 102. (①).

Next, the browser 109 accesses the address  
"www.foo.co.jp", the server controller 102, and requires  
the server controller 102 for text information of the  
5 input address. (②)

In response to the request, the server controller  
102 transmits the following text information to the  
client (③):

```
10 <HTML>
    <HEAD>
    <TITLE>home page of www.foo.co.jp</TITLE>
    </HEAD>
    <BODY>
15 Welcome to www.foo.co.jp
    <applet code=webview width=400 height=300>
    <param name=scopel value="100,200,-100,100,600,1000">
    <param name=messagel value="E S building, 200,200">
    </BODY>
20 </HTML>
```

The text information includes an <applet> tag.  
This tag means that "Display the applet at a designated  
position". Accordingly, the browser 109 (client  
25 controller 107) again accesses the server controller 102  
and requires the server controller 102 to transmit an

applet named "webview". (④)

The applet is an intermediate execution format code generated by java compiler. The applet is stored in the memory 106 of the server controller 102. The browser 109  
5 corresponding to java downloads the applet from the server controller 102 and executes it in the browser 109. (⑤)

As the applet stored in the server controller 102 is platform-independent, the applet operates on various platforms.

10 The applet compares the camera control information and the combining condition, then based on the result of comparison, an annotation is combined with the video image from the camera 101 at an appropriate position in the video image, and the combined image is displayed in  
15 an area 110-c. (⑥) Further, the browser 109 has means for receiving input from the user.

Next, the server controller 102 returns the applet to the client controller 107. The client controller 107 executes the applet.

20 Hereinbelow, the operation procedure of the applet, i.e., the control procedure of the CPU will be described with reference to Fig. 27.

First, at step S1301, the browser 109 reads the <param> tag which is text information transmitted to the  
25 client controller 107.

The <param> tag describes range designation of

camera information (zooming, panning, tilting), a message to display by the browser of the client if these zooming, panning and tilting are within the designated ranges.

- 5           Note that arbitrary number of items may be described. When a plurality of items are described, numbers from "1" are assigned as suffixes to the respective tags.

          An example of the text information obtained by the  
10 browser 109 of the client controller 107 is as follows:

```
<HTML>
<HEAD>
<TITLE>home page of www.foo.co.jp</TITLE>
15 </HEAD>
<BODY>
Welcome to www.foo.co.jp
<applet code=webview width=400 height=300>
<param name=message1 value="E S Building">
20 <param name=panRange1 value="-100,100">
<param name=tiltRange1 value="0,100">
<param name=zoomRange1 value="1.0,1.2">
<param name=locate1 value="0,0">
<param name=message2 value="ABC Computer Company">
25 <param name=panRange2 value="-50,50">
<param name=tiltRange2 value="0,50">
```



```

    <param name=zoomRange2  value="3.0,3.6">
    <param name=locate2  value="5.0">
    <param name=message3  value="Shoes shop">
    <param name=panRange3  value="-100,0">
5   <param name=tiltRange3  value="0,100">
    <param name=zoomRange3  value="1.0,1.2">
    <param name=locate3  value="10,0">
    </BODY>
    </HTML>

```

10

The applet obtains the content of the <param> tag by the following command:

```
value=getParameter("message1");
```

15

By executing this command, the value of the <param> tag named "message1", i.e., the character string "E S Building" is obtained as returning value. Such command is repeated to obtain all the <param> tags.

20 The details of the contents of the respective tags will be described below.

A tag named "message" indicates a message to be displayed for a user.

A tag named "panRange" indicates the minimum and  
 25 maximum values of the range of panning of the camera.

A tag named "tiltRange" indicates the minimum and

maximum values of the range of tilting of the camera.

A tag named "zoomRange" indicates the minimum and maximum values of the range of zooming of the camera.

A tag named "locate" indicates a position in a  
5 display screen where a message is overlaid when zooming  
is one time (equal size).

At step S1302, the content of the tag obtained at  
step S1301 is initialized into array and stored.

The message is stored as an array named "message";  
10 the panning minimum value is stored as an array named  
"panRangeMin; the panning maximum value is stored as an  
array named "panRangeMax"; the tilting minimum value is  
stored as an array named "tiltRangeMin"; the tilting  
maximum value is stored as an array named  
15 "tiltRangeMax"; the zooming minimum value is stored as  
an array named "zoomRangeMin"; the zooming maximum value  
is stored as an array named "zoomRangeMax"; the x  
coordinates of the message (when zooming is equal size)  
is stored as an array named "locateX"; and the y  
20 coordinates of the message (when zooming is equal size)  
is stored as an array named "locateY".

At this time, the message 0 is stored as a 0-th  
element, and the message 1 is stored as a first element.

The array of the respective values are as follows:

25

message [0] = "E S Building"

```

message [1] = "ABC Computer Company"
message [2] = "Shoes shop"

....

panRangeMin [0] = -100
5 panRangeMin [1] = -50
panRangeMin [2] = -100

....

panRangeMax [0] = 100
panRangeMax [1] = 50
10 panRangeMax [2] = 100

```

Next, at step S1303, an user interface is generated.

Fig. 28 shows an example of the user interface.

15 In Fig. 28, numeral 401 denotes a video-image display area where an image sent from the server controller 102 is displayed; 402, a slider bar to control panning of the camera of the server; 403, a slider bar to control tilting of the camera of the server; 404, a slider bar

20 to control zooming of the camera of the server; and 405, a toggle button to select whether or not annotations on respective objects in the video image are overlay-

displayed in the image area. Note that a mode where the annotations on the respective objects in the video image

25 are overlay-displayed in the image area is referred to as a "message display mode".

Note that the slider bars 402 to 404 and the toggle button 405 functions when they are clicked or dragged by a mouse (not shown).

Next, at step S1304 in Fig. 27, it is checked  
5 whether or not any event has been made (by clicking by the mouse or the like) from the user. If NO, the process proceeds to step S1309, while if YES, proceeds to step S1305.

At step S1305, it is determined whether or not the  
10 event detected at step S1304 is that by pressing the toggle button 405. If it is determined that the event is toggle-button pressing event, the process proceeds to step S1306. If it is another event, the process proceeds to step S1307.

15 At step S1306, a message display mode is set in accordance with the status of the toggle button. Specifically, if the toggle button is in selected status, the setting of the message display mode is turned ON. If the toggle button is not in selected status, the setting  
20 of the message display mode is turned OFF.

At step S1307, it is detected which of the slider bars 402 to 404 is operated, as the event detected at step S1304, then the current value of the operated slider bar is obtained, and the process proceeds to step  
25 S1308.

At step S1308, the value of any of the slider bar

402 to 404 is transmitted to the camera controller 103 via the communication interface units 108 and 105. For example, in a case where the user has operated the tilt slider bar 403, if the value of the slider bar is "100",  
5 the camera control information "tilt=100" is sent to the camera controller 103 through steps S1304, S1305, S1307 and S1308.

The camera controller 103 changes the direction of the camera 101 such that it has the "tilt=100" direction.

10 At step S1309, image data obtained by the video-image input unit 104 is obtained via the communication interface units 105 and 108. The obtained image data corresponds to one frame of a video image obtained by the camera 101.

15 In the present embodiment, the server controller transmits image data to the respective client controllers 107 at predetermined intervals (e.g., one second). Accordingly, the obtained video image displayed in the video-image display area 401 of the respective  
20 client controllers 107 is a moving image having a small number of frames per unit time. Note that this does not pose any limitation on the present invention. The communication data amount can be reduced by arranged such that video-image reception is instructed from a  
25 user in accordance with necessity. On the other hand, in a system in which obtained image data can be transmitted

by using a network line for high-speed communication, a complete moving image can be displayed by transmitting a video image at tens of frames/second.

At step S1310, the camera control information,  
5 obtained by the camera controller 103 from the camera 101, is obtained via the communication interface units 105 and 108. The camera control information indicates present direction (pan and tilt) and zoom setting values of the camera 101.

10 For example, values "zoom=1, pan=30, tilt=100" is obtained.

This means that "the camera 101 is currently in a state where zoom=1, pan=30 and tilt=100".

Next, at step S1311, the setting of the message  
15 display mode is examined. If the message display mode is ON, the process proceeds to step S1312, otherwise, proceeds to step S1314.

At step S1312, the camera control information obtained at step S1310 and the arrays initialized at  
20 step S1302 are compared, and items corresponding to the current camera information are searched.

For example, the first item is a condition "pan value is -100 to 100, tilt value is 0 to 200, and zoom value is 1.0 to 1.2", as follows:

25

<param name=message1 value="E S Building">

```
<param name=panRange1 value="-100,100">  
<param name=tiltRange1 value="0,100">  
<param name=zoomRange1 value="1.0,1.2">  
<param name=locat1 value="0,0">
```

5

Assuming that the current camera position is "pan=10, tilt=20, zoom=1.1", it corresponds to the condition described in the first item.

Further, depending on the value of the camera  
10 control information obtained at step S1310, none of the items may correspond to the information. In this case, the process proceeds to step S1314, at which the CPU displays only the received video image in the video-image display area 401 without combining a message with  
15 the image. If even one item corresponds to the information, the process proceeds to step S1313.

At step S1313, a message (annotation on the video image) is obtained from the arrays initialized at step S1302. The CPU combines the message with the image data  
20 obtained at step S1309, and displays the combined image data in the video-image display area 401.

The coordinates to display the message are obtained by calculation in accordance with the following procedure.

25

Procedure 1: First, the central position of the range of

the condition, and the difference is added to the position.

$x1 = (\text{panRangeMax} + \text{panRangeMin}) / 2 + \text{locateX}$

$y1 = (\text{tiltRangeMax} + \text{tiltRangeMin}) / 2 + \text{locateY}$

5

Procedure 2: The difference is obtained between current pan and tilt values (the values obtained at step S1308) and the values at the procedure 1.

$x2 = x1 - \text{panValue}$      $\text{panValue} = \text{current pan value}$

10     $y2 = y1 - \text{tiltValue}$      $\text{tiltValue} = \text{current tilt value}$

Procedure 3: The values at the procedure 2 is multiplied with the current zoom value (the value obtained at step S1308).

15     $x3 = x2 * \text{zoomValue}$      $\text{zoomValue} = \text{current zoom value}$

$y3 = y2 * \text{zoomValue}$

Procedure 4: The difference is obtained between the coordinates at the center of the screen and the values

20    obtained at the procedure 3.

Then, the message is displayed at the position.

For example, if the first item has the above condition "pan value is -100 to 100, tilt value is 0 to  
25    200, and zoom value is 1.0 to 1.2", the following values are obtained by the procedure 1:



$$x1 = (100 - (-100)) / 2 + 0 = 0$$

$$y1 = (100 - 0) / 2 + 0 = 50$$

Then the following values are obtained by the  
5 procedure 2:

$$x2 = x1 - 10 = -10$$

$$y2 = y1 - 20 = 30$$

Then the following values are obtained by the  
10 procedure 3:

$$x3 = x2 * 1.1 = -11$$

$$y3 = y2 * 1.1 = 33$$

Accordingly, the character string "E S Building"  
15 can be combine-displayed at a position represented by  
coordinates (-11,33) from the center of the screen  
displaying the video image.

Fig. 29A shows the user interface at that time,  
and Fig. 29B shows a case where the current direction  
20 and zoom of the camera are "pan=10, tilt=20, zoom=1.1",  
i.e., only the zoom value is changed from the status  
shown in Fig. 29A.

As it is understood from these figures, in  
accordance with video-image display status (image-  
25 sensing status of the camera) such as pan, tilt, zoom  
and the like, whether or not the annotations on the

video image (respect objects) are displayed, or display position of the annotations are automatically determined, and combine-display is performed. Thus, annotations on the video image can be displayed corresponding to the  
5 image-sensing range, zoom ratio and the like of the camera.

Especially, the present embodiment determines whether or not a predetermined annotation is combine-displayed in accordance with the zoom ratio. Accordingly,  
10 an annotation which is not helpful unless its corresponding object is displayed in somewhat large size, such as the annotation "ABC Computer Company" in Fig. 29B, is appropriately combine-displayed in accordance with necessity. Also, an annotation which is not helpful  
15 unless its corresponding object is displayed in somewhat small size is appropriately combine-displayed in accordance with necessity.

Note that the present invention is not limited to the selection as to whether or not respective  
20 annotations are combined in accordance with the zoom ratio of a video image, as the above embodiment. It may be arranged such that the size of the respective annotations are changed in accordance with the zoom ratio of the video image. Specifically, the annotation  
25 "ABC Computer Company" is not displayed in the case shown in Fig. 29A, but as a modification, the annotation

"ABC Computer Company" in smaller font size than in font size in Fig. 29B may be displayed.

Further, the above embodiment combine-displays  
respective annotations in accordance with the zoom ratio  
5 of an obtained video image, however, the present  
invention is not limited to this arrangement. It may be  
arranged such that combining of the annotations is  
controlled, based on the sizes of respective objects in  
the video image. For example, in a case where the  
10 position of the camera is movable, when a predetermined  
object is image-sensed at the same zoom ratio, the size  
of the object in the video image might change.  
Accordingly, the present invention also includes a case  
where combining of an annotation is controlled in  
15 accordance with a predetermined object size compared  
with a reference size.

#### <Sixth Embodiment>

Next, a sixth embodiment where character  
20 information is overlaid on video image obtained from a  
remote camera server, similar to the fifth embodiment,  
will be described.

The difference from the fifth embodiment is that  
messages (annotations on objects) in different formats  
25 can be displayed in accordance with user's selection. In  
the sixth embodiment, display of a message in Japanese

or English is selected.

Fig. 6 shows a user interface having an operation unit for selection of this construction.

To realize the present embodiment, the following  
5 modification is made to the fifth embodiment.

First, the text information stored in the server controller 102 is changed as follows:

```
<applet code=webview width=400 height=300>  
10 <param name=messageJ1 value="E S ビル">  
    <param name=messageE1 value="E S Building">  
    <param name=panRange1 value="-100,100">  
    <param name=tiltRange1 value="0,100">  
    <param name=zoomRange1 value="1.0,1.2">  
15 <param name=locate1 value="0,0">
```

As the text information obtained from the server controller 102 in the fifth embodiment is changed, at step S1301 in Fig. 27, the routine to obtain the <param>  
20 tag is changed as follows:

In the first embodiment:

```
value = getParameter("message1");
```

In the present embodiment:

```
25 Jvalue = getParameter("messageJ1");//Japanese message  
    Evalue = getParameter("messageE1");//English message
```

At step S1302, arrays are prepared in  
correspondence with a plurality of messages.

At step S1303, in addition to the display example  
5 in Fig. 28, a panel 406 as shown in Fig. 30 is formed to  
select "display a message in Japanese or English".

At step S1305, similar to the fifth embodiment, it  
is checked whether or not the event of selecting  
display/not display a message has been made. If this  
10 event has been made and "display" has been selected from  
the "not display", it is further checked whether English  
or Japanese has been selected by the panel 406. In  
accordance with the selection by the panel 406, the  
message display mode is set at step S1306.

15 At step S1313, it is determined "whether English  
mode or Japanese mode is currently selected", and a  
message corresponding to the selection is combine-  
displayed.

By the above change, the user manually select to  
20 display the message in Japanese or English. The present  
invention is not limited to this arrangement, but also  
includes cases, "one from three or more languages is  
selected", "a message for children or a message for  
adults is selected", "a message for beginners, middle-  
25 class learners or advanced learners is selected", and  
the like.

Further, the present invention also includes cases,  
"display format is selected, i.e., whether an annotation  
on a predetermined displayed object is displayed in form  
of an image or in characters is selected" and  
5 "outputting an annotation in audio message or in  
characters is selected". That is, according to the  
present embodiment, the format to output an annotation  
on a predetermined object in the video image can be  
selected, in accordance with image-sensing condition for  
10 image sensing a video image from a camera or condition  
for displaying the video image on the display 110.

<Seventh Embodiment>

Next, a seventh embodiment where character  
15 information is overlaid on a video image obtained from a  
remote camera server and the image is displayed, similar  
to the fifth embodiment, will be described with  
reference to Fig. 31.

The difference from the fifth embodiment is that  
20 when a user performs click operation or the like with  
respect to the video-image display area 401, the display  
image automatically changes to another home page  
(specifically, in a case where an annotation on an  
object is a unique name, and the home page is presented  
25 on the Internet by a party or the like having the unique  
name).

In the present embodiment, when an annotation in the video-image display area 401 (e.g., "E S Building") is clicked, a home page on the Internet presented by "E S Building" is displayed in the video-image display area  
5 401.

To realize the present embodiment, modification is made to the fifth embodiment as follows.

First, the text information stored in the server controller 102 is changed as follows:

10

```
<applet code=webview width=400 height=300>
<param name=messageJ1 value="E S ビル">
<param name=messageE1 value="E S Building">
<param name=panRange1 value="-100,100">
15 <param name=tiltRange1 value="0,100">
<param name=zoomRange1 value="1.0,1.2">
<param name=locat1 value="0,0">
<param name=nextlink1 value="http://www.es.com/">
```

20

As the text information obtained from the server controller 102 in the description of the fifth embodiment is changed, at step S1301 in Fig. 31, a routine to obtain the next link is added to the routine obtaining the <param> tag. Specifically, the following  
25 instruction is added to the routine. In Fig. 31, steps identical to those in Fig. 27 have the same reference

numerals, and the steps different from those in Fig. 27 will be described in detail. The instruction is:

```
link = getParameter("nextlink1");
```

5

The address of the home page as the next link, i.e., "http://www.es.com" is stored at the variable "link".

Further, at step S1302 in Fig. 31, arrays for  
10 storing the next link are added.

Further, at step S1307 in Fig. 31, it is checked whether the event made by the user is "camera control event". If it is not the "camera control event", it is checked whether or not the event is "event on the video-  
15 image display area". Note that processings other than steps S1316 and S1317 are the same as those in the fifth embodiment.

If it is determined at step S1316 that the event is not "event to click on the video-image display area",  
20 the process proceeds to step S1309.

If it is determined at step S1316 that the event is the "event to click on the video-image display area", first, at the video-image display area 401, X and Y coordinates at a position clicked by the pointing device  
25 (mouse) are obtained.

If the coordinates are within a distance from the



displayed message, the process proceeds to step S1317,  
at which a home page having an address corresponding to  
the message stored at step S1302 is received and  
displayed. Note that the coordinates of the message can  
5 be obtained in accordance with the procedure described  
in the fifth embodiment.

If it is determined at step S1316 that the event  
is the "even to click on the video-image display area"  
but the coordinates of the clicked position is not  
10 within the distance from the displayed message, the  
process proceeds to step S1309.

By the above operation, when a message is  
displayed in the video-image display area 401, if a  
position around the message is clicked by the mouse, a  
15 home page associated with the message is newly displayed.  
Accordingly, a home page, which relates to an object,  
which attracts the user, in a video image realtimely  
obtained by the camera, is quickly displayed, thus an  
image display apparatus with excellent operability can  
20 be provided.

Note that the annotations or messages in the fifth  
to seventh embodiments are not limited to explanations  
of respective objects, but may be messages from people  
relating to the respective objects, E-mail addresses or  
25 addresses on the Internet relating to the respective  
objects, information on the sites where the objects

actually exist, variable information on the respective objects, and the like.

For example, if the video-image display area 401 shows a sky as an object, weather information (variable  
5 information) may be the annotation on this object.  
Further, if the object is a company building or the like, a message from the company, a company name, the company's address or the like may be the annotation on the object. Further, if the object is a residential  
10 section, the address of the residential section may be the annotation on the object.

As described above, according to the fifth to seventh embodiments, as well as a video image provided from a camera server, a message relating to the video  
15 image can be appropriately combined with the video image in accordance with image-sensing condition of the camera or display condition, and the combined image is displayed.

Further, as the user can select to combine a  
20 message with the video image and display the combined image or not, it is possible to combine a message in accordance with the user's preference.

Further, by preparing a plural formats of messages with respect to one object, an appropriate message can  
25 be selected in accordance with various requirements from the user.

Further, when a message combined with a displayed object is clicked, a home page of an address relating to the message can be displayed. Therefore, if there is a message such as company name in the video-image display area 401, a link to the company's home page can be embedded there, thus an image display apparatus with excellent operability can be provided.

Further, when receiving and displaying a video image, whether or not an additional image (the message or annotation in the present embodiment) is combined with the video image can be selected in accordance with the zoom ratio in image sensing the image. Thus, additional information relating to the displayed video image can be combine-displayed in a state appropriate to various situations.

Specifically, in accordance with the zoom ratio in image sensing the video image, additional information relating to the object in the video image can be combine-displayed. Further, as the display format of the additional information can be selected, the additional information can be combine-display in accordance with the user's preference.

Further, as additional information to be combine-displayed is a link image to start to receive an image from another network terminal, video image display with excellent operability can be performed.

Note that the present invention can be applied to a system constituted by a plurality of devices (e.g., host computer, interface, reader, printer) or to an apparatus comprising a single device (e.g., copy machine, facsimile apparatus).

Further, the object of the present invention can be also achieved by providing a storage medium storing program codes for performing the aforesaid processes to a system or an apparatus, reading the program codes with a computer (e.g., CPU, MPU) of the system or apparatus from the storage medium, then executing the program.

In this case, the program codes read from the storage medium realize the functions according to the embodiments, and the storage medium storing the program codes constitutes the invention.

Further, the storage medium, such as a floppy disk, a hard disk, an optical disk, a magneto-optical disk, CD-ROM, CD-R, a magnetic tape, a non-volatile type memory card, and ROM can be used for providing the program codes.

Furthermore, besides aforesaid functions according to the above embodiments are realized by executing the program codes which are read by a computer, the present invention includes a case where an OS (operating system) or the like working on the computer performs a part or entire processes in accordance with designations of the

program codes and realizes functions according to the above embodiments.

Furthermore, the present invention also includes a case where, after the program codes read from the  
5 storage medium are written in a function expansion card which is inserted into the computer or in a memory provided in a function expansion unit which is connected to the computer, CPU or the like contained in the function expansion card or unit performs a part or  
10 entire process in accordance with designations of the program codes and realizes functions of the above embodiments.

As many apparently widely different embodiments of the present invention can be made without departing from  
15 the spirit and scope thereof, it is to be understood that the invention is not limited to the specific embodiments thereof except as defined in the appended claims.